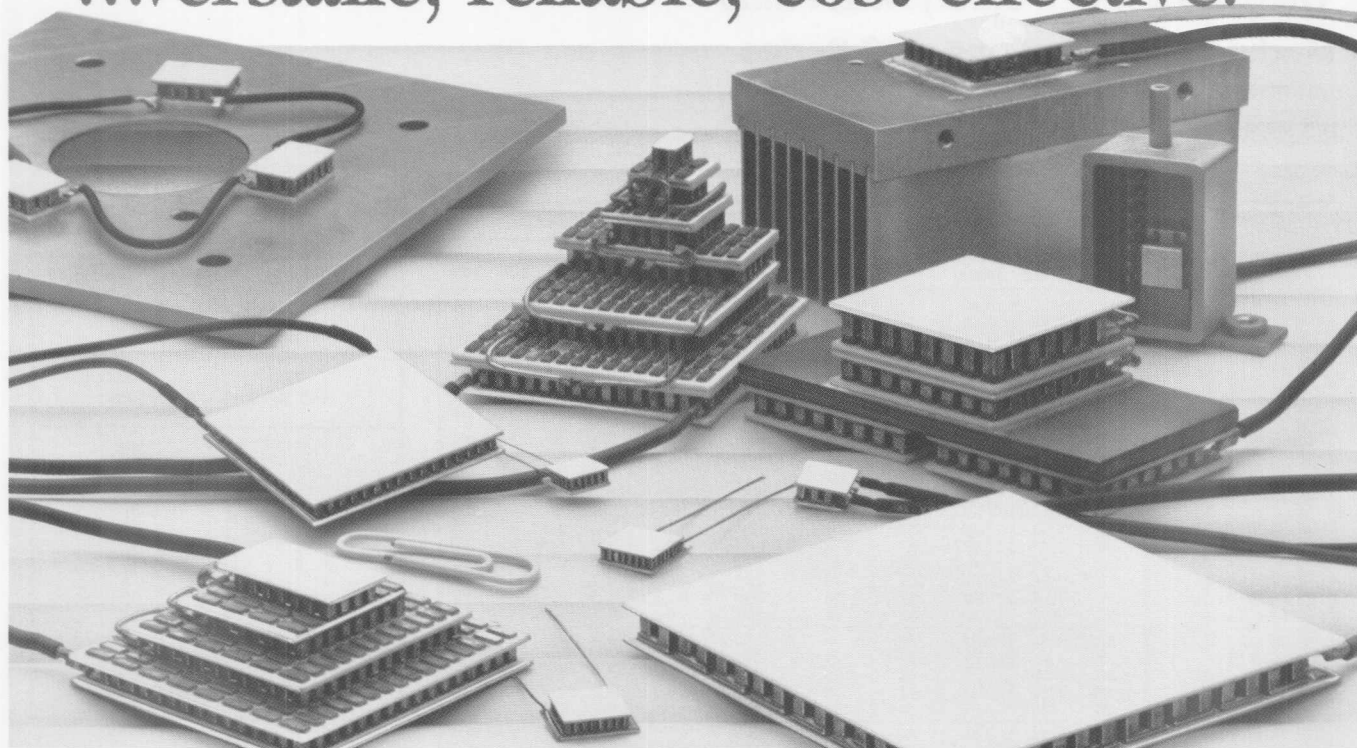


Thermoelectric Cooling from MELCOR ...versatile, reliable, cost-effective.



If your design criteria for temperature control include high reliability and versatility, small size, low weight and intrinsic safety, you owe it to yourself to investigate Frigichip™—the miniaturized heat pump from MELCOR.

Frigichips are solid state, thermoelectric heat pumps that utilize the Peltier effect to perform the same cooling functions as freon-based compression or absorption refrigerators...but in miniature!! Use them for space cooling of cabinet enclosures, cooling of special shapes, plates, castings or spot cooling of small individual devices. Use for precise temperature control by cycling from cooling to heating.

Broad Spectrum of Applications

MELCOR Frigichips have been proven for three decades in a wide range of thermal management applications, including:

- Fiber optic & other electro-optic cooling applications
- Food service refrigeration & other commercial/institutional applications
- Appliances: portable 12 volt refrigerators, water & beverage coolers, etc.
- Instruments for physical, chemical, optical & electronic analysis
- Laboratory & scientific instruments, computers, cameras
- Medical & pharmaceutical equipment
- Military/aerospace applications
- And countless others

Only Frigichip Combines All These Benefits

- Quick cooling to below ambient—economically
- Reduced space/size/weight
- Reliable solid state operation—no sound or vibration (lifetimes of > 200,000 hours!)
- Precision temperature control capability
- Minimum, if any, electrical noise

- DC operation
- Electrical power generation from waste heat
- More than 100 standard single stage types available, from sub-miniature, low capacity to compact, high-capacity
- Multi-stage cascades to -95°C , designed to specifications

Wide Choice of Standard and Custom Modules

MELCOR offers you more than 100 standard Frigichip modules ranging in size from 2 x 3 mm to 62 x 62 mm and cooling capacities from 0.2 to 125 watts. The tables and graphs on the following three pages provide module specifications and a method for choosing the module that's ideal for your application. In addition, MELCOR can provide custom assemblies and multi-stage cascades, with or without heat exchangers.

From the World Leader in Thermoelectrics

More than 30 years ago, MELCOR was the first to provide industry with practical thermoelectric devices. Today, we continue to advance this remarkable technology...and provide most of the world's thermoelectric modules! For more details or immediate assistance, just call our applications group.



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Telex: 843314 (MELCOR TRN)

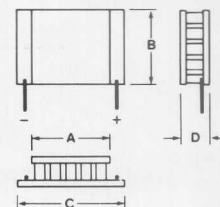
SOLID STATE COOLING WITH THERMOELECTRICS

Thermoelectric (Peltier) Heat Pump Module Specifications—FC Series

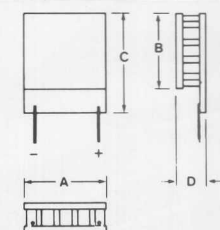
FC SERIES

		I max Amps	Hot Face Th = 25°C			Universal Multipliers			Dimensions, mm			
			Q max ⁽¹⁾ (watts)	V max (volts)	ΔT max (°C)	N No. of Couples	G Geometry Factor	G x N	A	B	C ⁽²⁾	D ⁽³⁾
STANDARD AND OPTION 2	FC 0.45-4-05	0.80	0.22	0.48	67	4	.016	0.06	1.8	3.4	3.4	2.4
	FC 0.45-8-05	0.80	0.43	0.97	67	8	.016	0.13	3.4	3.4	5.0	2.4
	FC 0.45-12-05	0.80	0.65	1.45	67	12	.016	0.19	3.4	5.0	5.0	2.4
	FC 0.45-18-05	0.80	0.97	2.18	67	18	.016	0.29	5.0	5.0	6.6	2.4
	FC 0.45-32-05	0.80	1.72	3.87	67	32	.016	0.51	6.6	6.6	8.3	2.4
	FC 0.45-66-05	0.80	3.56	7.98	67	66	.016	1.06	9.9	9.1	11.5	2.4
	FC 0.6-4-06	1.20	0.32	0.48	67	4	.024	0.10	2.2	4.2	4.2	2.7
	FC 0.6-8-06	1.20	0.65	0.97	67	8	.024	0.19	4.2	4.2	6.2	2.7
	FC 0.6-12-06	1.20	0.97	1.45	67	12	.024	0.29	4.2	6.2	6.2	2.7
	FC 0.6-18-06	1.20	1.46	2.18	67	18	.024	0.43	6.2	6.2	8.3	2.7
	FC 0.6-32-06	1.20	2.59	3.87	67	32	.024	0.77	8.3	8.3	10.3	2.7
	FC 0.6-66-06	1.20	5.34	7.98	67	66	.024	1.58	12.3	11.3	14.4	2.7
	FC 0.6-4-05	1.50	0.40	0.48	67	4	.030	0.12	2.2	4.2	4.2	2.4
	FC 0.6-8-05	1.50	0.81	0.87	67	8	.030	0.24	4.2	4.2	6.2	2.4
	FC 0.6-12-05	1.50	1.21	1.45	67	12	.030	0.36	4.2	6.2	6.2	2.4
	FC 0.6-18-05	1.50	1.82	2.18	67	18	.030	0.54	6.2	6.2	8.3	2.4
	FC 0.6-32-05	1.50	3.23	3.87	67	32	.030	0.96	8.3	8.3	10.3	2.4
	FC 0.6-66-05	1.50	6.67	7.98	67	66	.030	1.98	12.3	11.3	14.4	2.4
	FC 0.7-4-05	2.00	0.54	0.48	67	4	.040	0.16	2.4	4.7	4.7	2.4
	FC 0.7-8-05	2.00	1.08	0.97	67	8	.040	0.32	4.7	4.7	7.0	2.4
	FC 0.7-12-05	2.00	1.62	1.45	67	12	.040	0.48	4.7	7.0	7.0	2.4
	FC 0.7-18-05	2.00	2.43	2.18	67	18	.040	0.72	7.0	7.0	9.3	2.4
	FC 0.7-32-05	2.00	4.31	3.87	67	32	.040	1.28	9.3	9.3	11.6	2.4
	OPTION 1	FC 0.45-7-05-1	0.80	0.38	0.85	67	7	.016	0.11	3.4	3.4	3.4
FC 0.45-11-05-1		0.80	0.60	1.33	67	11	.016	0.18	3.4	5.0	3.4	2.4
FC 0.45-17-05-1		0.80	0.92	2.06	67	17	.016	0.27	5.0	5.0	5.0	2.4
FC 0.45-31-05-1		0.80	1.67	3.75	67	31	.016	0.50	6.6	6.6	6.6	2.4
FC 0.45-65-05-1		0.80	3.51	7.85	67	65	.016	1.04	9.9	9.1	9.9	2.4
FC 0.6-7-06-1		1.20	0.57	0.85	67	7	.024	0.17	4.2	4.2	4.2	2.7
FC 0.6-11-06-1		1.20	0.89	1.33	67	11	.024	0.26	4.2	6.2	4.2	2.7
FC 0.6-17-06-1		1.20	1.38	2.06	67	17	.024	0.41	6.2	6.2	6.2	2.7
FC 0.6-31-06-1		1.20	2.51	3.75	67	31	.024	0.74	8.3	8.3	8.3	2.7
FC 0.6-65-06-1		1.20	5.26	7.86	67	65	.024	1.56	12.3	11.3	12.3	2.7
FC 0.6-7-05-1		1.50	0.71	0.85	67	7	.030	0.21	4.2	4.2	4.2	2.4
FC 0.6-11-05-1		1.50	1.11	1.33	67	11	.030	0.33	4.2	6.2	4.2	2.4
FC 0.6-17-05-1		1.50	1.72	2.08	67	17	.030	0.51	6.2	6.2	6.2	2.4
FC 0.6-31-05-1		1.50	3.13	3.75	67	31	.030	0.93	8.3	8.3	8.3	2.4
FC 0.6-65-05-1		1.50	6.57	7.86	67	65	.030	1.95	12.3	11.3	12.3	2.4
FC 0.7-7-05-1		2.00	0.95	0.85	67	7	.040	0.28	4.2	4.2	4.2	2.4
FC 0.7-11-05-1		2.00	1.49	1.33	67	11	.040	0.44	4.2	6.2	4.2	2.4
FC 0.7-17-05-1		2.00	2.30	2.06	67	17	.040	0.68	6.2	6.2	6.2	2.4
FC 0.7-31-05-1		2.00	4.18	3.75	67	31	.040	1.24	8.3	8.3	8.3	2.4

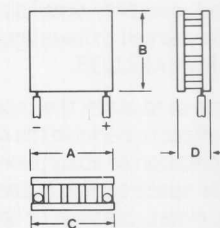
DIMENSIONS



FC Series — Standard



FC Series — Option Two⁽¹⁾



FC Series — Option One

Notes:

- (1) Q max rated value at $\Delta T = 0^\circ$, I max and V max, $T_h = 25^\circ\text{C}$
- (2) Option 2, Dim. C = Dim. B + :
1.7 mm (FC 0.45)
2.1 mm (FC 0.6 and FC 0.7)
- (3) Thickness (D, mm) for Type L only.

WIRE STANDARDS

Module Type	Wire Gauge (AWG)	Length (mm/in.)	Insulation
FC 0.45-ALL	32 (SOLID)	50/2.0	None
FC 0.6-ALL	30 (SOLID)	50/2.0	None
FC 0.7-ALL	30 (SOLID)	50/2.0	None

Interfacing: Both hot and cold faces lapped flat, TYPE L. Both faces metallized and tinned, TYPE TT. Hybrid, hot face tinned, cold face lapped, TYPE TL. Hot face lapped, cold face tinned, TYPE LT.

See page 4 for performance graphs, examples, and construction specifications.



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SOLID STATE COOLING WITH THERMOELECTRICS

Thermoelectric (Peltier) Heat Pump Module Specifications—CP Series

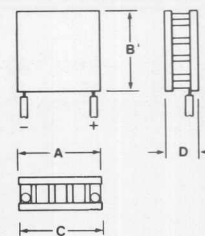
CP SERIES

Catalog Number	I max Amps	Hot Face Th = 25°C			Universal Multipliers			Dimensions, mm			
		Q max ⁽¹⁾ (watts)	V max (volts)	ΔT max (°C)	N No. of Couples	G Geometry Factor	G x N	A	B	C	D ⁽²⁾
CP 1.0-7-08L	2.5	1.2	0.85	67	7	0.05	0.35	8	8	8	4.0
CP 1.0-17-08L	2.5	2.9	2.06	67	17	0.05	0.85	12	12	12	4.0
CP 1.0-31-08L	2.5	5.3	3.75	67	31	0.05	1.55	15	15	15	4.0
CP 1.0-63-08L	2.5	10.6	7.62	67	63	0.05	3.15	15	30	15	4.0
CP 1.0-71-08L	2.5	12.0	8.60	67	71	0.05	3.55	23	23	23	4.0
CP 1.0-127-08L	2.5	21.4	15.4	67	127	0.05	6.35	30	30	30	4.0
CP 1.0-7-06L	3.0	1.4	0.85	67	7	0.06	0.42	8	8	8	3.6
CP 1.0-17-06L	3.0	3.4	2.06	67	17	0.06	1.02	12	12	12	3.6
CP 1.0-31-06L	3.0	6.3	3.75	67	31	0.06	1.86	15	15	15	3.6
CP 1.0-63-06L	3.0	12.7	7.62	67	63	0.06	3.78	15	30	15	3.6
CP 1.0-71-06L	3.0	14.4	8.60	67	71	0.06	4.26	23	23	23	3.6
CP 1.0-127-06L	3.0	25.7	15.4	67	127	0.06	7.62	30	30	30	3.6
CP 1.0-7-05L	3.9	1.8	0.85	67	7	0.078	0.55	8	8	8	3.2
CP 1.0-17-05L	3.9	4.5	2.06	67	17	0.078	1.33	12	12	12	3.2
CP 1.0-31-05L	3.9	8.2	3.75	67	31	0.078	2.42	15	15	15	3.2
CP 1.0-63-05L	3.9	16.6	7.62	67	63	0.078	4.91	15	30	15	3.2
CP 1.0-71-05L	3.9	18.7	8.60	67	71	0.078	5.54	23	23	23	3.2
CP 1.0-127-05L	3.9	33.4	15.4	67	127	0.078	9.90	30	30	30	3.2
CP 1.4-3-10L	3.9	0.8	0.36	70	3	0.078	0.23	5	10	5	4.7
CP 1.4-7-10L	3.9	1.8	0.85	70	7	0.078	1.33	10	10	10	4.7
CP 1.4-11-10L	3.9	2.9	1.33	70	11	0.078	0.86	10	15	10	4.7
CP 1.4-17-10L	3.9	4.5	2.06	70	17	0.078	1.33	15	15	15	4.7
CP 1.4-31-10L	3.9	8.2	3.75	70	31	0.078	2.42	20	20	20	4.7
CP 1.4-35-10L	3.9	9.2	4.24	70	35	0.078	2.73	15	30	15	4.7
CP 1.4-71-10L	3.9	18.7	8.60	70	71	0.078	5.54	30	30	30	4.7
CP 1.4-127-10L	3.9	33.4	15.4	70	127	0.078	9.90	40	40	40	4.7
CP 1.4-3-06L	6.0	1.2	0.36	67	3	0.12	0.36	5	10	5	3.8
CP 1.4-7-06L	6.0	2.8	0.85	67	7	0.12	0.84	10	10	10	3.8
CP 1.4-11-06L	6.0	4.4	1.33	67	11	0.12	1.32	10	15	10	3.8
CP 1.4-17-06L	6.0	6.9	2.06	67	17	0.12	2.04	15	15	15	3.8
CP 1.4-31-06L	6.0	12.5	3.75	67	31	0.12	3.72	20	20	20	3.8
CP 1.4-35-06L	6.0	14.2	4.24	67	35	0.12	4.20	15	30	15	3.8
CP 1.4-71-06L	6.0	28.7	8.60	67	71	0.12	8.52	30	30	30	3.8
CP 1.4-127-06L	6.0	51.4	15.4	67	127	0.12	15.24	40	40	40	3.8
CP 1.4-3-045L	8.5	1.6	0.36	67	3	0.17	0.51	5	10	5	3.3
CP 1.4-7-045L	8.5	3.8	0.85	67	7	0.17	1.19	10	10	10	3.3
CP 1.4-11-045L	8.5	6.0	1.33	67	11	0.17	1.87	10	15	10	3.3
CP 1.4-17-045L	8.5	9.2	2.06	67	17	0.17	2.89	15	15	15	3.3
CP 1.4-31-045L	8.5	16.8	3.75	67	31	0.17	5.27	20	20	20	3.3
CP 1.4-35-045L	8.5	19.0	4.24	67	35	0.17	5.95	15	30	15	3.3
CP 1.4-71-045L	8.5	38.5	8.60	67	71	0.17	12.07	30	30	30	3.3
CP 1.4-127-045L	8.5	68.8	15.4	67	127	0.17	21.60	40	40	40	3.3
CP 2-7-10L	9.0	4.2	0.85	70	7	0.18	1.26	15	15	15	5.6
CP 2-15-10L	9.0	9.1	1.82	70	15	0.18	2.70	15	30	15	5.6
CP 2-17-10L	9.0	10.3	2.06	70	17	0.18	3.06	22	22	22	5.6
CP 2-31-10L	9.0	18.8	3.75	70	31	0.18	5.58	30	30	30	5.6
CP 2-49-10L	9.0	29.7	5.93	70	49	0.18	8.82	36	36	36	5.6
CP 2-71-10L	9.0	43.1	8.60	70	71	0.18	12.78	44	44	44	5.6
CP 2-127-10L	9.0	77.1	15.4	70	127	0.18	22.86	62	62	62	5.6
CP 2-7-06L	14.0	6.6	0.85	67	7	0.28	1.96	15	15	15	4.6
CP 2-15-06L	14.0	14.2	1.82	67	15	0.28	4.20	15	30	15	4.6
CP 2-17-06L	14.0	16.0	2.06	67	17	0.28	4.76	22	22	22	4.6
CP 2-31-06L	14.0	29.3	3.75	67	31	0.28	8.66	30	30	30	4.6
CP 2-49-06L	14.0	46.2	5.93	67	49	0.28	13.72	36	36	36	4.6
CP 2-71-06L	14.0	67.0	8.60	67	71	0.28	19.88	44	44	44	4.6
CP 2-127-06L	14.0	120.0	15.4	67	127	0.28	35.56	62	62	62	4.6
CP 2.8-32-06L	24.0	51.8	3.87	67	32	0.48	15.36	40	40	40	5.0
CP 5-31-10L	39.0	81.5	3.75	70	31	0.78	24.18	55	55	55	5.8
CP 5-31-06L	60.0	125.0	3.75	67	31	1.20	37.20	55	55	55	4.9

WIRE STANDARDS

Module Type	Wire Gauge (AWG)	Length (mm/in.)	Insulation
CP 1.0-ALL	24 (STRANDED)	114/4.5	PVC
CP 1.4-ALL	18 (STRANDED)	114/4.5	PVC
CP 2-ALL	18 (STRANDED)	114/4.5	PVC
CP 2.8-ALL	16 (STRANDED)	114/4.5	PVC
CP 5-XX-10	14 (STRANDED)	114/4.5	PVC
CP 5-XX-06	12 (STRANDED)	114/4.5	PVC

DIMENSIONS



CP Series

Notes:

- (1) Q max rated value at $\Delta T = 0^\circ$,
I max and V max, $T_h = 25^\circ\text{C}$
- (2) Thickness (D,mm) for Type L only.

Interfacing: Both hot and cold faces lapped flat, TYPE L. Both faces metallized and tinned, TYPE TT. Hybrid, hot face tinned, cold face lapped, TYPE TL. Hot face lapped, cold face tinned, TYPE LT. Two face soldering (TYPE TT) in sizes larger than 12 x 12 mm is not recommended. Consult Melcor for details.

See page 4 for performance graphs, examples, and construction specifications.



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SOLID STATE COOLING WITH THERMOELECTRICS

How To Use Universal Performance Graphs:

APPROACH #1: Convert universal scale values to those of specific module selected:

1. Convert Q_c/GxN (scale values) to Q_c (watts heat pumped): Multiply Q_c/GxN values by module GxN (from table in module specifications chart).
2. Convert V/N values to V (volts input): Multiply V/N values by module N from table.
3. Convert 50 G, 40 G, etc. to I (amps input) values: Multiply 50 by module G , etc.

APPROACH #2: From application, knowing required Q_c , T_c and T_h , select appropriate module:

1. Calculate $\Delta T = T_h - T_c$; select operating current I ($I_{max} = 50$ G).
2. From universals, obtain Q_c/GxN . Calculate GxN .
3. Select appropriate module from GxN table in module specifications chart.

EXAMPLE: Required $Q_c = 31$ Watts,
 $T_c = +5^\circ\text{C}$, $T_h = +35^\circ\text{C}$

1. $\Delta T = 35^\circ - 5^\circ = 30^\circ\text{C}$. Choose operating current (typically from 30 G to 40 G) at 35 G (equals $35/50 = 70\%$ of I_{max} .)

2. From $T_h = 35^\circ\text{C}$ graph ($\Delta T = 30^\circ$, $I = 35$ G), obtain $Q_c/GxN = 1.65$; Then $GxN = Q_c/1.65 = 31/1.65 = 18.8$.

3. Choose module with $GxN \geq 18.8$; choose CP1.4-127-045 ($GxN = 21.6$) or CP2-71-06 ($GxN = 19.9$).

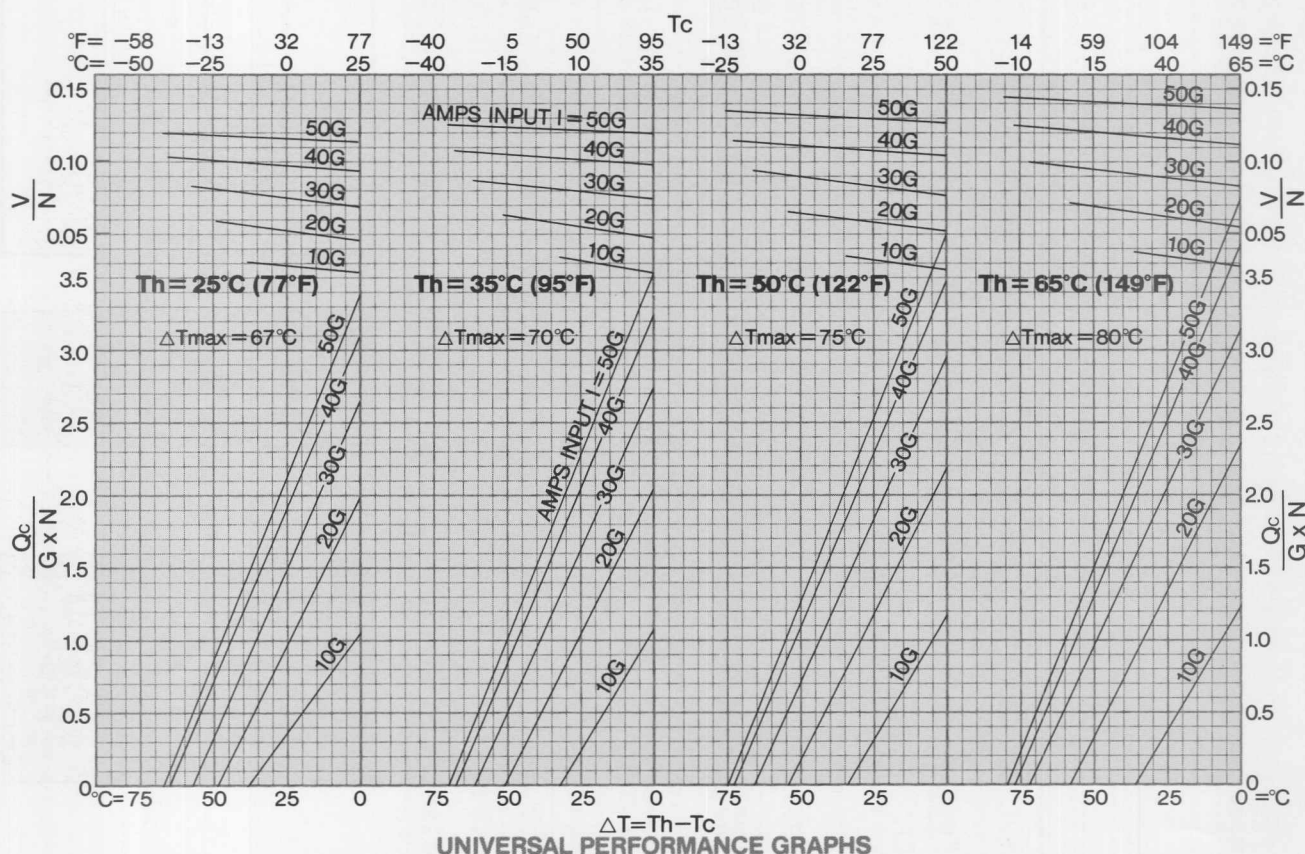
If desired, approach #1 may now be followed for module selected.

Model CP1.4-127-06L

CP Series, Type L

1.4 x 1.4mm Thermoelement Cross Section
127 Thermocouples

.06" Thermoelement Height



T_c = Cold Face Temperature; T_h = Hot Face Temperature; I = Module Current, Amps; V = Module Voltage, Volts; Q_c = Watts Heat Pumped;
 N = Number of Thermocouples; G = Thermoelement Geometry Factor

Thermoelectric (Peltier) Heat Pump Module Construction

Thermocouples constructed of N & P elements of highest grade bismuth telluride in form of oriented polycrystalline ingots. Ingot ends soldered to copper bus bars interfaced with ceramic plates, affording good mechanical integrity, high dielectric strength and thermal conduction. Temperature range, -150°C to $+80^\circ\text{C}$. Solid

state construction. Both hot and cold faces lapped flat, TYPE L. Both faces metallized and tinned, TYPE TT. Hybrid, hot face tinned, cold face lapped, TYPE TL. Hot face lapped, cold face tinned, TYPE LT.